

SLAD SURVIVABILITY SOLDIER SYSTEM

Despite the fact that the world military, social, and economic environments are changing and the United States' (U.S.) defense resources are diminishing, many areas of the world present potentially highly lethal environments wherein the U.S. military may still be expected to react to regional conflicts affecting our strategic interests. In these areas, the U. S. military must succeed quickly and decisively, and do so with minimum casualties.



The soldier is the key to the U.S. Army's Modernization Plan objective of land force dominance. Although the U.S. Army is reducing the number of new weapons produced and developed the need to maintain technological superiority will drive scientific and technical efforts to develop new and innovative technologies to overmatch any potential adversary. Integral to the Army's modernization objectives is the need to improve the survivability of its forces and (implicitly) its systems.

This Functional area, one of seven to the SLAD Survivability Functional Areas, describes the soldier as a system, the threats to his/her survivability, susceptibilities and vulnerabilities to threats, and the actions taken and planned to enhance survivability. The subject area consists of seven sections. The common threads throughout are the survivability categories -- detection avoidance, hit avoidance, penetration avoidance and kill avoidance.

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General. In today's Army, the emphasis is on developing a Continental United States (CONUS) -based Force Projection Army -- a flexible, combat-ready force that can respond

quickly to crisis situations. This force must be able to deter aggression; if the deterrence should fail, this force must defeat the enemy quickly with minimal casualties. As the centerpiece of a smaller, more lethal, and more projectable Army, our soldiers require modernized weapons, clothing, and equipment to survive the many environments, terrain's, and levels of military threat they will encounter. A highly trained and properly equipped soldier is a critical and inseparable component in successfully employing all Army systems. The soldier is a unique weapon system platform. The soldier must perform a range of operations supporting many different missions around the world, including peacetime engagements, deterrence, and conflict prevention, while maintaining a core competency to provide land power dominance at any level of conflict.

The Threat. The soldiers of today's Army are not fully prepared to meet all of the field conditions they are expected to face. Technological advances have allowed the Army to achieve superior overmatch with most major weapons systems. However, with current equipment, our soldiers can only hope for technological parity with their opponents in close combat operations. Chemical agents, antipersonnel devices, kinetic and directed- energy weapons, and harsh environmental factors, as well as the burden of the soldier's load and physiological effects, threaten the safety, lives, and effectiveness of our combat soldiers. In addition, soldiers will increasingly face enemy technologies that make detection and identification easier.

The Soldier System. The Soldier System is a family of integrated systems for each soldier; it consists of everything that is worn, carried, or consumed for individual use in a tactical environment. More than 110 Army acquisition programs focus on the individual mounted and dismounted soldier and aviator crewman in combat, combat support, and combat service support roles. The Soldier System is uniquely different from all other major weapons systems in two significant ways. First, the Soldier System frame is human; its loss is not measurable in dollars, nor can a replacement be manufactured. Second, the soldier is the common element of all Army major weapons system platforms. Additionally, soldiers come in many shapes and sizes, making them a unique and variable element in platform integration. Every major Army system's operation is affected by the quality of the Soldier System and the synergy created by the soldiers' ability to interface effectively and efficiently with their equipment and systems. Modernizing and fielding an effective and efficient Soldier System is among the Army's major challenges in meeting the battlefield demands of the future.

The Challenge. The Army leadership is committed to modernizing all soldiers, but enormous challenges lie ahead, both technically and in adequate fielding of enhancement capability. As the traditional approaches to prioritizing and modernizing Army units become less relevant, there is a constant struggle to keep units equipped with updated clothing and equipment. The dynamic fielding environment leads to an overall absence of modernized equipment and clothing in many deploying units and dramatically impairs mission effectiveness. This impact has become apparent in training and battle rehearsal exercises at Army training centers and in discussions with commanders and soldiers in the field.

Major technical challenges for improving the Soldier System include weight reduction, power sources, power management, and most importantly, systems integration. These directly affect the soldier's mental and physical agility. For example, the technologies that can convey vast amounts of information to the soldier exist or are emerging. Determining the correct balance of necessary information at the right time is a complex challenge. Soldiers will need to have (1) instantaneous access to information that is relevant to their missions, (2) the ability to process that information to communicate voice and data up and down the chain (3) the ability to use the information effectively to accomplish the mission. Providing this information while reducing soldier load requirements continues to be an essential challenge. Materiel solutions to these requirements will greatly increase the potential capabilities of the soldier, but at a cost. Despite the emphasis on lightweight materials, the weight of soldier's equipment greatly exceeds what an individual can carry and still operate effectively.

Other challenges to soldier survivability must be solved through Research, Development and Acquisition (RDA). One challenge includes medical research for protection against nuclear, biological, and chemical (NBC) threats for individual soldiers, crews, and units. Additional challenges include (1) improvements in evacuation technology, (2) materiel systems that fully integrate the soldier's safety and survivability as a critical component of the system's performance, lethality, and survivability, (3) fratricide reduction technology that fully considers soldier performance parameters and not just materiel solutions, and (4) assurance that crews can complete missions using NBC protective gear without the gear itself endangering their lives.

Improving Soldier Survivability. Central to soldier survivability will be the capability of the soldier to accurately fire on the enemy without exposing himself/herself. Survivability systems will integrate multiple threat protection against ballistic, flame/thermal, and chemical/biological agents, and directed energy, surveillance, and environmental hazards. Combat identification capabilities will be integrated into the Soldier System to minimize fratricide. Exploiting of the digital net, coupled with inherent enhancements, will significantly improve the survivability of the individual soldier and the entire force through increased controlled dispersion and a common picture of the battlefield. The composition and configuration of soldier system's components will vary with each soldier's mission and responsibilities. Each subsystem will contribute to overall Soldier System survivability.

Looking Ahead. Modernizing soldier equipment is a continuous, incremental process designed to integrate, package, and provide synergy to the individual soldier's lethality, command and control, mobility, survivability, and sustainment capabilities on the 21st Century digitized battlefield. The following tables summarize Soldier Survivability in the near (FY00-01), mid (FY02-05), and far (FY06-14) terms. They identify known threats to soldier survivability and promising technologies that are planned or under development for countering those threats. Additionally, they list remaining survivability shortfalls.

Near Term (FY00-01) Soldier Survivability Summary

Threat	Susceptible/Vulnerable Components	Programs/Technologies Scheduled or Available During The Near Term	Remaining Survivability Opportunities
ISR	<ul style="list-style-type: none"> Personnel Tactical Equipment Combat Vehicles 	<ul style="list-style-type: none"> Low-Cost Low-Observable Systems ULCANS 	<ul style="list-style-type: none"> Improved counter to IR sensors No IR signature reduction Optical augmentation protection for all optical/electro-optical devices
EW	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Combat Net Radios 	
Direct/Indirect Fires	<ul style="list-style-type: none"> Personnel Tactical Equipment Combat Vehicles 	<ul style="list-style-type: none"> Interceptor Body Armor Fighting Position Overhead Cover Concealable Body Armor NAVSTAR GPS 	<ul style="list-style-type: none"> Insufficient situational awareness to warn of threat weapons and targeting beyond the range of threat direct-fire weapons No non-line-of-sight weapons systems Fratricide reduction
Directed Energy	<ul style="list-style-type: none"> Personnel Sensitive Electronic Components 	<ul style="list-style-type: none"> Laser eye protection 	<ul style="list-style-type: none"> Laser protection may not keep up with proliferation of lasers available. No system to provide protection for all personnel against lasers No capability for protecting sensitive electronic components against HPM and RF weapons
Nuclear	<ul style="list-style-type: none"> Personnel Tactical Equipment Combat Vehicles 	<ul style="list-style-type: none"> Pocket Dosimeter Pocket Radiac 	<ul style="list-style-type: none"> No blast or initial radiation protection

Near Term (FY00-01) Soldier Survivability Summary (continued)

Threat	Susceptible/Vulnerable Components	Programs/Technologies Scheduled or Available During The Near Term	Remaining Survivability Opportunities
Chemical & Biological	<ul style="list-style-type: none"> Personnel Tactical Equipment Combat Vehicles 	<ul style="list-style-type: none"> Improved in CB detection capabilities Acquiescing a biological vaccine capability Automating NBC information distribution CARC M40A1/M42A2 protective masks M45 protective mask JSLIST 	<ul style="list-style-type: none"> Soldier performance severely degraded in MOPP 4. Unacceptable heat stress. No integrated protection system for individual soldiers. No noncorrosive, all-agent decontaminate for personal equipment or sensitive electronic equipment. No self-decontamination coatings for tactical equipment. Protective suits still vulnerable to agent breakthrough from wind or blast. Improved airflow through protective mask filters (at least 54 L/min.). Neck dams for protective masks. Improved protective gloves/socks.
Mines	<ul style="list-style-type: none"> Personnel Tactical Equipment Combat Vehicles 	<ul style="list-style-type: none"> AntiPersonnel Obstacle Breaching System NDI mine protect boot 	<ul style="list-style-type: none"> No capability to deal with magnetic mines
Environment	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Microclimatic cooling—mounted soldier Soldier Individual Power Source Personnel Airdrop 	<ul style="list-style-type: none"> No microclimatic cooling—dismounted soldier Body armor weight and cause of extra heat stress

Mid Term (FY02-05) Soldier Survivability Summary

Threat	Susceptible/Vulnerable Components	Programs/Technologies Scheduled or Available During The Mid Term	Remaining Survivability Opportunities
ISR	<ul style="list-style-type: none"> Personnel Tactical Equipment Combat Vehicles 	<ul style="list-style-type: none"> Low-Cost, Low-Observable Systems Upgrades 	To be determined by emerging technologies
EW	<ul style="list-style-type: none"> Tactical Equipment 	<ul style="list-style-type: none"> Combat Net Radios 	To be determined by emerging technologies
Direct/Indirect Fires	<ul style="list-style-type: none"> Personnel Tactical Equipment Combat Vehicles 	<ul style="list-style-type: none"> Land Warrior Mounted Warrior Air Warrior CIDDS Advanced Bomb Suit 	<ul style="list-style-type: none"> No fully integrated protection for all soldiers No fully integrated combat identification
Directed Energy	<ul style="list-style-type: none"> Personnel 	<ul style="list-style-type: none"> Improved laser eye protection for Land, Air, and Mounted Warrior 	<ul style="list-style-type: none"> Laser protection may not keep up with proliferation of lasers available
Nuclear	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Air Warrior nuclear flash protection 	
Chemical & Biological	<ul style="list-style-type: none"> Personnel Tactical Equipment Combat Vehicles 	<ul style="list-style-type: none"> Lightweight Stand-off Chemical Agent Detector Chemical Imaging Detector Biodetection Individual Soldier Detector Sorbent Decontamination Catalytic decontamination JSGPM/JSAM JSLIST II Joint Protective Aircrew Ensemble 	<ul style="list-style-type: none"> Soldier performance severely degraded in MOPP No integrated protection system for individual soldiers Protective suits still vulnerable to agent breakthrough from wind or blast Improved airflow through protective mask filters (at least 54 L/min.) Neck dams for protective masks
Mines	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Hand-Held Stand-off Mine Detector System Land Warrior Foot Protection 	
Environment	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Advanced Integrated Collective Protection System Chemical Biological Protective Shelter 	<ul style="list-style-type: none"> No microclimate cooling —dismounted soldier Body armor weight and cause of extra heat stress

Far Term (FY06-14) Soldier Survivability Summary

Threat	Susceptible/Vulnerable Components	Programs/Technologies Scheduled or Available During The Far Term
ISR	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Nanoscience Strategic Research Objective (SRO)
EW	<ul style="list-style-type: none"> Tactical Equipment 	
Direct/Indirect Fires	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Individual ballistic protection
Directed Energy	<ul style="list-style-type: none"> Personnel Sensitive Electronic Components 	<ul style="list-style-type: none"> Agile laser eye protection
Nuclear	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Joint point radiac
Chemical & Biological	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Chemical/biological protection—selectively permeable membranes Multifunctional materials
Mines	<ul style="list-style-type: none"> Personnel Tactical Equipment 	
Environment	<ul style="list-style-type: none"> Personnel Tactical Equipment 	<ul style="list-style-type: none"> Enhanced Soldier performance SRO Compact power SRO Integrating Soldier modular components

